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Discovery of Early Cretaceous (Barremian) decapod Crustacea from the Arida Formation of Wakayama Prefecture, Japan

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Abstract. ***Hoploparia*** **sp. (Astacidea, Nephropidae) and** ***Callianassa*** **(s. l.)** ***sakakuraorum*** **sp. nov. (Thalassinidea, Callianassidae) are described from the Lower Cretaceous Arida Formation in Wakayama Prefecture, Japan. Both genera are recognized for the first time from Lower Cretaceous (Barremian) deposits of Japan. These occurrences indicate that** ***Hoploparia*** **and** ***Callianassa*** **reached Japan—the west side of the North Pacific region—by the Barremian.**

Key words: Arida Formation, Cretaceous, Crustacea, Decapoda, Japan

Introduction

Early Cretaceous decapod Crustacea from Japan previously were only known from the Aptian Miyako Group, northwestern Japan (Takeda and Fujiyama, 1983). The purpose of this paper is to describe two species of decapods, *Hoploparia* sp. (Astacidea, Nephropidae) and *Callianassa* (s. l.) *sakakuraorum* sp. nov. (Thalassinidea, Callianassidae) from the Lower Cretaceous Arida Formation of Wakayama Prefecture, southwestern Japan. Hitherto, *Hoploparia* from the Lower Cretaceous of the North Pacific region has been known from the Hauterivian of Oregon (Feldmann, 1974), while *Callianassa* (s. l.) has not been found in Lower Cretaceous deposits of that region.

The specimens were collected from sandy mudstone exposed at Suhara [Loc. 02 of Komatsu (1999)], Yuasa-cho, Wakayama Prefecture. Obata and Ogawa (1976) and Matsukawa and Obata (1993) indicated that the geologic age of the formation is Barremian. Komatsu (1999) studied the depositional environments and molluscan assemblages of the Arida Formation in the area and divided the formation into four depositional facies. The decapod fossils occurred in his facies 3, which is characterized by the predominant occurrence of *Nanonavis yokoyamai* and seems to indicate an inner-shelf paleoenvironment (Komatsu, 1999).

The described specimens are deposited in the Mizunami Fossil Museum (MFM).

Systematic paleontology

Infraorder Astacidea Latreille, 1802
Superfamily Nephropoidea Dana, 1852
Family Nephropidae Dana, 1852
Subfamily Homarinae Huxley, 1879
Genus ***Hoploparia*** McCoy, 1849

Hoploparia sp.

Figure 1.1, 1.2

Description. — *Hoploparia* with small-sized body. Carapace laterally compressed. Anterior half of carapace poorly preserved. Rostrum lacking. Surface finely granulated. Postcervical groove deep dorsally, obliquely extending ventrally. Hepatic groove obscurely defined, curving to join antennal and cervical grooves. Cervical groove deep, slightly arcuate, extending ventrally to join antennal groove. Antennal groove nearly straight. Gastro-orbital groove shallow, extending to near upper part of cervical groove. Antennal region with antennal ridge. Dorsal and supraorbital ridges well developed. Intermediate carina weakly developed. Branchial region finely punctuate.

Abdominal somites 1–6 smooth. Pleuron of somite 1 somewhat reduced; posteroventral corner with posteroventrally directed spine. Pleuron of somite 2 subrectangular; anteroventral corner rounded; ventral margin gently convex; posteroventral corner with posteroventrally directed spine; posterior margin gently concave; surface with marginal furrows joining transverse furrow on anterior part of tergum. Pleura of somites 3 and 4 with sharp, posteroventral corners; surfaces with shallow, broad marginal furrow along posterior margin. Pleuron of somite 6 reduced. Telson, uropod and pereiopods unknown.

Discussion.—The carapace with dorsal, supraorbital and antennal ridges readily distinguishes the species from two known Japanese species, *Hoploparia miyamotoi* Karasawa, 1998 from the Maastrichtian Izumi Group and *Hoploparia kamuy* Karasawa and Hayakawa, 2000 from the Turonian-Santonian part of the Upper Yezo Group. *Hoploparia* sp. possesses characters most like those of *Hoploparia collignoni* (Van Straelen, 1949) from the Albian of Madagascar and *Hoploparia riddlensis* Feldmann, 1974

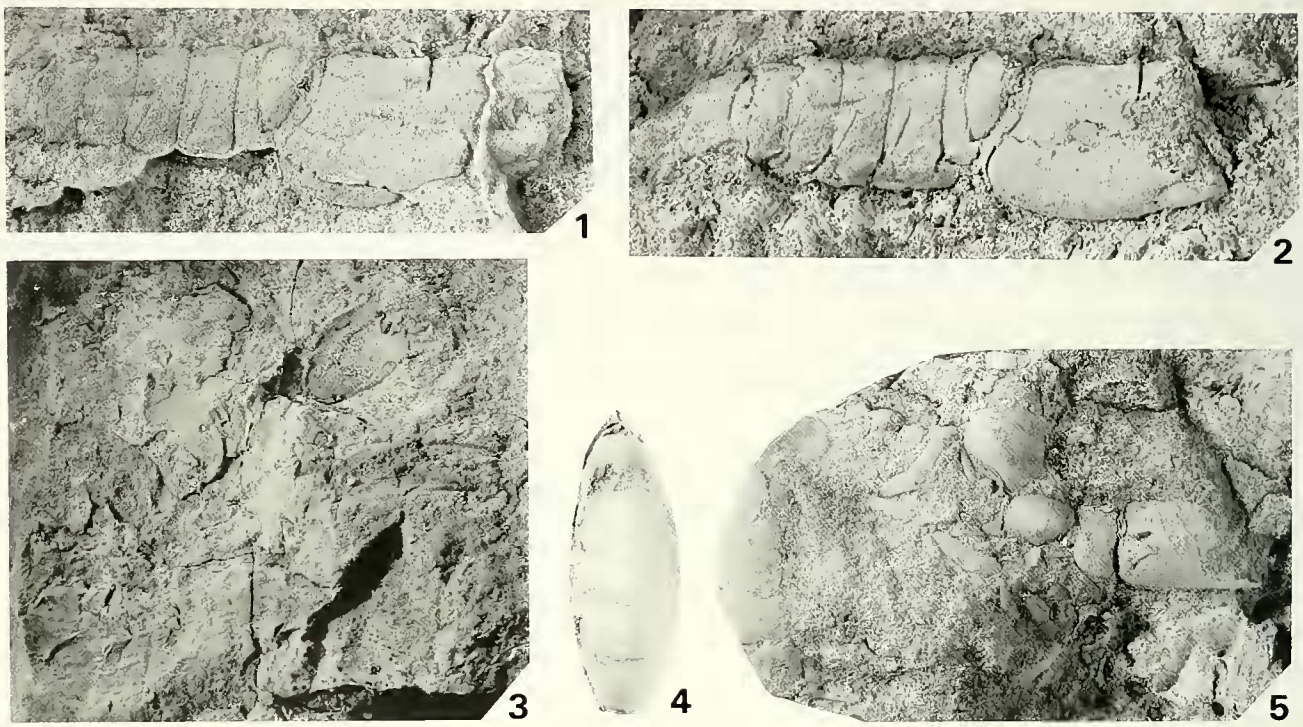

Figure 1. **1, 2.** *Hoploparia* sp., MFM247111, carapace and abdomen. ×2.0. **1**: Latex cast of external mould of the specimen; **2**: lateral view. **3–5.** *Callianassa* (s. l.) *sakakuraorum* sp. nov. **3**: MFM247016 (paratype), external mould of both chelipeds and abdomen, ×2.0, lateral view. **4**: MFM247015 (holotype), abdomen, ×2.0, dorsal view. **5**: MFM247015 (holotype), carapace, cheliped, pereiopods and abdomen, ×2.0, lateral view.

from the Hauterivian of Oregon. However, the present species has well developed supraorbital and antennal ridges on the carapace. *Hoploparia* sp. is similar to *Hoploparia longimana* (Sowerby, 1826) from the Barremian of Argentina and the Aptian-Cenomanian of England, and *Hoploparia mesembria* Etheridge, 1917 from the Albian of Australia, but differs in the presence of an obscurely defined hepatic groove and a well developed antennal ridge. *Hoploparia longimana* and *H. mesembria* possess a dentate supraorbital ridge and an antennal region with three large projections.

Hoploparia, earliest known from the Neocomian of Europe, U. S. A and Argentina (Aguirre-Urreta, 1989), has been recorded from Cretaceous-Palaeogene deposits in Europe, U. S. A, Japan, Argentina, Australia, New Zealand, and Antarctica (Aguirre-Urreta, 1989; Karasawa and Hayakawa, 2000).

Material examined.—MFM247111 collected by Y. Mizuno.

Infraorder Thalassinidea Latreille, 1831
Superfamily Callianassoidea Dana, 1852
Family Callianassidae Dana, 1852
Genus ***Callianassa*** Leach, 1814

Callianassa (s. l.) ***sakakuraorum*** sp. nov.

Figure 1.3–1.5

Diagnosis.—Moderate-sized callianassid. Pereiopods 1 chelate, equal-sized, dissimilar. Palm of right cheliped, equal to fixed finger length, slightly longer than high; carpus short, about 1/4 propodus length, height 3/4 length; merus slightly longer than carpus, rhomboidal in lateral view, dorsal and ventral margins strongly convex without meral hook and spines. Propodus of left cheliped about equal to right propodus length, rather slender; palm slightly longer than fixed finger, height about 4/5 length.

Description.—Moderate sized callianassid. Only right branchial region of carapace preserved. Abdominal somite 1 poorly preserved. Somite 2 slightly longer than 3. Pleura of somites 2–5 well developed with rounded posteroventral corner. Pleuron of somite 6 reduced with convergent lateral margins. Telson about equal to length of somite 6 with longitudinal ridge on dorsal surface. Uropod unknown.

Pereiopods 1 chelate, equal-sized, dissimilar. Dactylus of right cheliped strongly curved ventrally with acutely pointed tip; dorsal and occlusal margins smooth. Fixed finger slightly longer than dactylus with acutely pointed tip; occlusal and ventral margins smooth. Palm rectangular in lateral view, equal to fixed finger length, slightly longer than high, with longitudinally convex lateral surface; dorsal and ventral margins smooth. Carpus short, about 1/4 propodus length, height 3/4 length, with nearly straight dorsal margin and strongly curved ventral margin. Merus slightly longer

than carpus, rhomboidal in lateral view, dorsal and ventral margins strongly convex without meral hook; lateral surface strongly vaulted. Ischium poorly preserved, slender without marginal teeth or spines. Propodus of left cheliped about equal to major propodus length, rather slender in outline, occupying about 3/4 major propodus height. Dactylus gently curved ventrally with acutely pointed tip; dorsal and occlusal margins smooth. Fixed finger slightly shorter than dactylus with acutely pointed tip; occlusal and ventral margin smooth. Palm rectangular in lateral view, slightly longer than fixed finger, height about 4/5 length, with smooth dorsal and ventral margins.

Pereiopod 2 not preserved. Carpus and merus of pereiopod 3 preserved; carpus flattened, slender, tapering proximally; merus flattened, about twice length of carpus with straight dorsal and gently convex ventral margins. Propodus, carpus, merus and ischium of pereiopod 4 preserved; propodus small, broken; carpus slender; merus about twice length of carpus; ischium about half carpus length. Pereiopod 5 unknown.

Discussion.—Manning and Felder (1991) recognized two families, seven subfamilies and 21 genera for taxa previously assigned to the extant Callianassidae, whilst Sakai (1999) reexamined all known extant members in the family and recognized four subfamilies and 10 genera. The generic placement of the present species awaits the discovery of better material bearing the maxilliped 3 and the telson, and it is considered best to place the specimen in *Callianassa* (s. l.) for the time being.

The genus *Callianassa* from the Cretaceous of Japan is represented by two species, "*Callianassa*" *ezoensis* Nagao, 1932 from the Maastrichtian Hakobuchi Sandstone and *Callianassa* (s. l.) *masanorii* Karasawa, 1998 from the Maastrichtian Izumi Group. *Callianassa* (s. l.) *sakakuraorum* differs from "*C.*" *ezoensis* in that pereiopods 1 have dissimilar chelipeds, smooth ventral margins of propodi, and a rhomboidal merus. Equal-sized pereiopods 1 with short fingers and carpi readily distinguish *C.* (s. l.) *sakakuraorum* from *C.* (s. l.) *masanorii*. The new species most resembles "*Callianassa*" *valida* Rathbun, 1935 from the Lower Cretaceous of Texas, but differs in having a shorter propodus of pereiopod 1 with a smooth dorsal margin and a rhomboidal merus of pereiopod 1. In *C.* (s. l.) *sakakuraorum* the dactylus of pereiopod 1 has a smooth dorsal margin whilst in "*C.*" *valida* it has a serrated dorsal margin.

The earliest known members of *Callianassa* (s. l.) have been recorded from the Neocomian of Europe (Glaessner, 1929) and the Valanginian of Argentina (Aguirre-Urreta, 1989). The Jurassic members of the genus were removed to the axiid genus *Etallonia* Oppel, 1861, by Förster (1977). The known distribution of *Callianassa* (s. l.) is from Upper Cretaceous-Recent worldwide (Glaessner, 1969).

Etymology.—The name is dedicated to Fujio and Norihiko Sakakura.

Material examined.—MFM247015 (holotype) collected by M. Chiba; MFM247016 (paratype) collected by N. Sakakura.

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